

Research on the Establishment of Construction Management System Caused by Environmental Change in the Construction Industry

— Based on the Case of Samsung Construction —

Kwon, Sang Moon

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Graduate School of Public Administration
Seoul National University*

1. Introduction

Our country's construction industry has rapidly accomplished quantitative growth in short period of time through Middle Eastern construction market in 1970's, the construction market of Southeast Asia in 1980's, and prosperity in domestic construction market including two million housing construction and the building of new city, etc. However, construction companies have followed the technology from advanced countries upon concentrating on quantitative growth, while they have disregarded qualitative growth for the 21st century such as research on construction skill, construction development, and overall management in construction, etc. Domestic and foreign construction environments lie on the turning point to tremendous changes like open construction market, improvement in construction capability for developing countries, and increase in intensive project with advanced technology.

In addition, current environment in construction industry has been under the

influence of extending economical effect which totally differs from previous one since the injection of emergency fund from IMF was decided because of foreign currency crisis in November 1997. Consequently, the appearance of bankrupted companies and consecutive decline in construction industry are expected due to financial difficulties.

To confront open construction market and to advance into foreign market, the development of overall management capability is required for all courses of construction from the find to maintenance and repair in business with discouraging construction management pattern focused on simple building. Therefore, EC (Engineering Constructor) should be accomplished, and CM (Construction Management), the foreign advanced technique of construction management necessary.

Compared with other fields, the competitiveness of Korean companies in the field of carrying out construction is relatively superior through experience with prosperity in domestic and foreign constructions. However, it is true that overall technology is inferior to advanced countries because the unification of technical elements and management system has not been achieved in the entire course of maintenance administration in construction projects.

Therefore, this report provides the basis of establishing construction management system for the 21st century by fundamentally resolving comprehensive problem in current construction industry, clarifying the necessity of introduction to CM method, management in construction field which has already developed and operated in Western advanced countries, for open market, and researching in the establishment of construction management system through the case of Samsung construction, the leading construction company in the nation.

2. Changes in the Environment of Construction Industry

2.1. The Opening of Construction Market and Change in National Construction Market¹⁾

As of January 1, 1997, a public construction market is open resulting in the complete opening of construction market. Because the service protocol was settled in Uruguay Round agreement which was held at Marrakesh, Morocco, in April 1994, the public construction work beyond certain scale should be ordered by international bids. Therefore, domestic construction market is going to be completely open to foreign construction companies. The government actually opened a private construction market with allowing the registration of foreign company's branch in general construction field starting from January 1, 1996. In addition, the Financial Economy Administration promoted 5-year investment by foreigners until the coming year of 2000. They made foreign companies possible to independently advance into construction-related 28 categories of business including professional construction business like hardware construction which had been previously allowed only as a joint venture with companies holding corresponding domestic license. Of course, as the opportunity of advance into the country is given to foreign companies, beneficially in return, our construction companies also attains the opportunity of overseas expansion; therefore, UR protocol does not seem to be unfavorable only to us. However, in majority opinion on this, they anticipate that domestic companies will face management crisis after open market. Because competition arises from opening a market and easing regulation, domestic market's order received becomes not easy as it used to be, and receiving an order is hardly guaranteed even through lobbying.

There is another reason why the opening of construction market is considered as

1) Korea National Housing Corporation (a research in the basis for the establishment of CM system in housing style, March 1997).

disadvantageous particularly to us. Although our construction industry has achieved remarkable growth since it entered the Middle East, the growth is actually limited to the aspects of carrying out construction. The field of planning/engineering in large-scale construction work and the category of supervision, construction management field fell much behind compared to advanced countries. In addition, due to the distinctiveness of domestic construction environment, a system for resolving construction claim has not become advanced. Consequently, the expansion of advanced countries to our market is expected to progress to the industry, concentrating on software technology rather than carrying out a construction project. We need to pay special attention to the advance of planning/ engineering field as well as of management, which has been protected with a invisible barrier.

The construction scale of domestic construction market is consistently increasing by continuous economic growth and the expansion project of social indirect capital. Because of open construction market, major construction companies of advanced countries will be very interested in our construction market if some problems among the obstacles of market entry become clear. The majority of people consider our construction industry to be internationally competitive relatively in carrying out construction rather than in planning/ engineering field. However, this only tells at the level of mere construction skill. Compared to our actual foreign construction order received and the international market share of advanced countries like America, Japan, EC, etc., the international competitiveness is remarkably inferior in construction fields like major turnkey project concomitant with construction management and engineering, comprehensive construction project, and lately increasing BTO (Build-Transfer-Operate, the method of earning profits by building, transferring ownership to the public, and operating facilities in the stipulated time). Therefore, in technology intensive project and major project like SOC, our construction market is very likely to be encroached by construction companies from advanced countries. Furthermore, as long as the temporary ownership of land is permitted, we expect the expansion of construction firm by Korean Japanese or of Japanese general commercial companies

Table 1. Structural Changes in each Subject of Economy due to Open Market.

Economy Subject	Aspect of Structural Change
General Construction Company Design Office	Subcontractors
Small and medium-sized Company	Insolvency
Professional Construction Company	Partial Insolvency Systematization (Specification) of Advanced Construction Company
Middle-ranking Construction Company	Subcontractor of Advanced Overseas Construction Company Role Charge as a Domestic Construction Industry Source.
Full-sized Construction Company	Specialization, and Research of Joint Work with Foreign Construction Company

possessing synthetic capabilities in development work. Especially in housing project, it will actively proceed with warning a housing business market that has been maintained with an easygoing way of thinking that building always yields sale in lots.

2.2. Effects on Expansion to Overseas Construction Market

As relative to the entry of foreign construction companies by open-door policy market, the overseas expansion of our construction companies is considered easy. Because UR protocol includes open-door agreement on government-raised market, market approach, and restriction on the nativistic policy of each country, in which a principle prefers natives, especially, the advance of a developing country into market appears to be easy.

Upon the entry of foreign construction companies, limitations such as the restriction of tender qualification for the protection of domestic construction companies,

limitation of labor force and equipment, and regulations in subcontract responsibility will be abolished based on the policy of native preference. The systemic contents changed by open-door market lists as follows:

- By the permission of market approach, it is possible to participate as equally as domestic companies in the entire courses of calling for bids, attaining to bids, contracting, and carrying out construction, and discrimination caused by license registration disappears.
- Since there is no restriction nor discrimination in foreign district bidding including that in America, Japan, and EC, we can run a business by advancing into actual location and establishing a branch office; however, it is much likely to be limited to labor-intensive, simple construction and engineering work due to inferiority in technology.
- Temporary supervision in foreign labor force and equipment is allowed; some of the personnel may obtain the right of permanent residence.
- Overseas construction performance is recognized on bidding.
- Provisions in the preference of native companies and use of domestic materials are annulled.
- The open principle system

Due to the articles described above, all construction work on public facilities is executed based upon the bidding principle of general public competition so that foreign construction companies can participate; therefore, the subject holding a private contract or prearrangement with native companies becomes to struggle.

2.3. The Era of IMF Control and Changes in Construction Industry²⁾

On November 21, 1997, the injection of emergency fund from IMF was decided

2) Kim Jun Han, the construction industry under the IMF era: effect and counterplan, The debate on counterplan for the construction industry under the IMF era, December 1997.

due to foreign exchange crisis. On December 3, the government concluded the agreement on the introduction of emergency fund in scale of total 550 billion dollars including 210 billion dollars, standby credit from IMF. The basic purpose of IMF standby credit is to improve international payments by demanding country within a fixed period of time. However, it tends to be granted for resolving financial difficulties. Especially, the support to Thailand (39 billion dollars, August 1997), Indonesia (101 billion dollars, October 1997), and Korea was toward financial difficulties as well as foreign exchange crisis for a developing country. Supporting fund for the structural adjustment excluding IMF standby credit comes to 340 billion dollars including 100 billion dollars from International Bank for Reconstruction and Development (IBRD), 40 billion dollars from Asian Development Bank (ADB), 100 billion dollars from Japan, 50 billion dollars from America, and 50 billion dollars from EU. Such special credit by IMF demands that the grant should be on condition of the presentation and fulfillment of economic normalization program through negotiation with IMF. Based on the promotion performance and fulfillment of this program, supporting fund is allowed as divided payments. The core of IMF adjustment plan that appeared in the examples of Mexico, Thailand, and Indonesia was the wide-ranging structural adjustment of financial industry as well as tight, macroscopic policy for the improvement of international payments in short period of time. In the situation of Korea, however, the memorandum of consent to grant IMF standby credit and structural adjustment fund is submitted so that all aspects of economic policy are under the supervision and superintendence of IMF from now on.

Such construction industry in the era of IMF supervision will be under the influence of extending economical effect which totally differs from previous one; for this situation, it will necessary to consider various possibilities.

After IMF held a council meeting in December 5 and decided to inject emergency fund into Korea, the government made an official announcement about the content of agreement with IMF. The announced content of agreement consists of three categories: macroscopic policy, structural adjustment of financing department, and other structural

reformation. The category of macroscopic policy is composed of a bill of financial reformation, structural adjustment, and measures to reformation; the category of structural reformation is composed of the liberalization of trade, corporate structural and administrative adjustment, reformation of labor force market, and information disclosure. The objective of economic policy program on which IMF advised and Korean Government agreed is listed as follows:

- 1) To form powerful framework of macroscopic economy which is able to appropriately adjust current transactions account with raising the amount of foreign exchange holding and blocking the pressure of price rise through reduction in budget and currency
- 2) To establish comprehensive strategy which aims at fund-raising and structural adjustment in financial area and enables successful supervision as well as clearer, more market-centered financial field
- 3) To take measures which enables further breakup of economic danger as companies reduce the proportion of excessive dependence on short-term financial obligation in financial institutions
- 4) Future economic policy program related to the above is concretely presented in IMF confidential document agreement memorandum disclosed on December 10, intention document, and confidential report on Korean economy, etc.

3. Establishment Plan of Construction Management System in Samsung Style

3.1. The Propulsion Direction of Samsung Style CM System

3.1.1. Understanding the Necessity of Samsung Style CM

Samsung construction recognizes the necessity of CM introduction according to the followings: Turn Key construction work order as well as private capital induction

business and SOC business increases as the environment of domestic and foreign construction market changes; foreign advanced companies with concentrated SOFT field encroaches on domestic market as it is open; technology-intensive, large-scale complex construction continuously increases.

Furthermore, CM raises management capacity and profitability, shows excellent effectiveness on CM in large-scale complex construction work, and improves business conduction capacity by introducing comprehensive management technique. The establishment of comprehensive business management system creates high value added. Compared to previous management system that reached the limit of profit earning by "carrying out construction first" individual management, this is possible by CM system through improvement of technique service that a client requests as well as comprehensive management system.

3.1.2. The Propulsion Strategy and Propulsion Plan of Samsung-style CM

With the introduction of high-degree, specialized advanced construction management system and building up the foundation of standardization and systematization in construction management, propulsion strategy is composed of ensuring the performance capacity of construction business management. It lists in steps as follows:

- Step 1 : Systematic performance of construction work management in existing simple contract work
- Step 2 : Improvement in engineering capacity by construction work performance TURN-KEY BASE, simultaneous progress of construction/the beginning of construction
- Step 3 : Development work like Gaduk island harbor construction work, SOC, joining of CM through self-work
- Step 4 : All-company-initiative spreading of CM
- Step 5 : Final settlement in CM

Table 2. CM Propulsion Plan by Steps (Preparation Step).

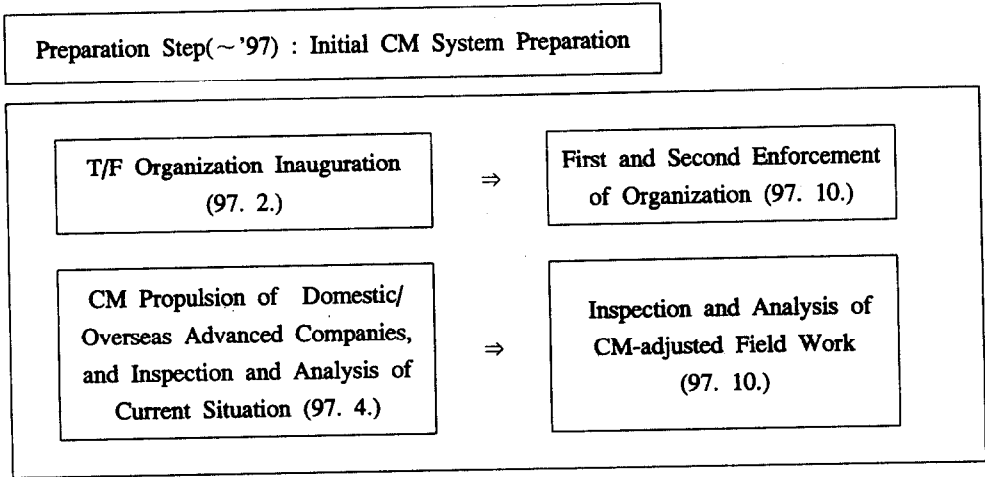


Table 3. CM Propulsion Plan by Steps (Introduction Step).

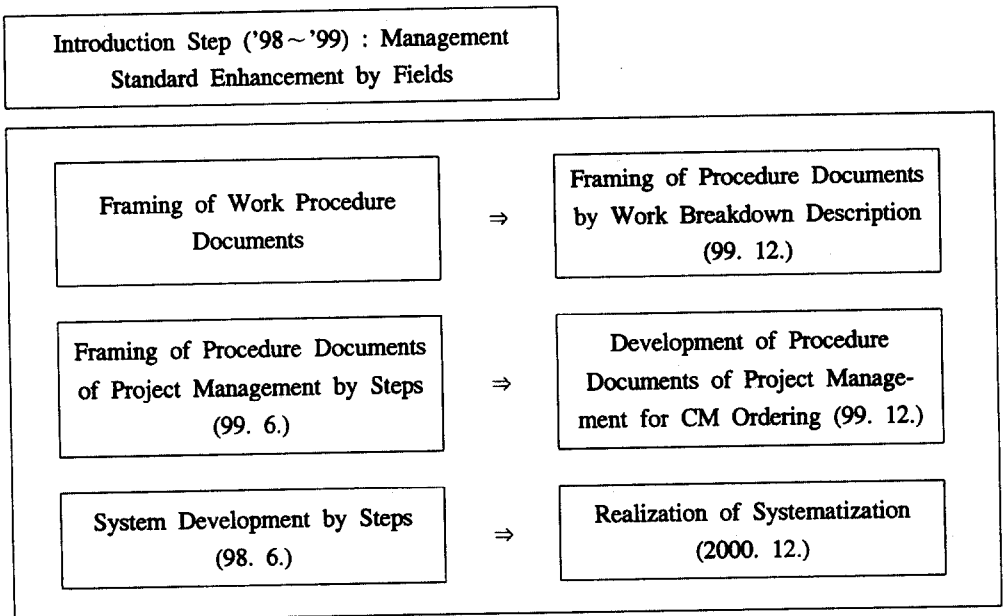
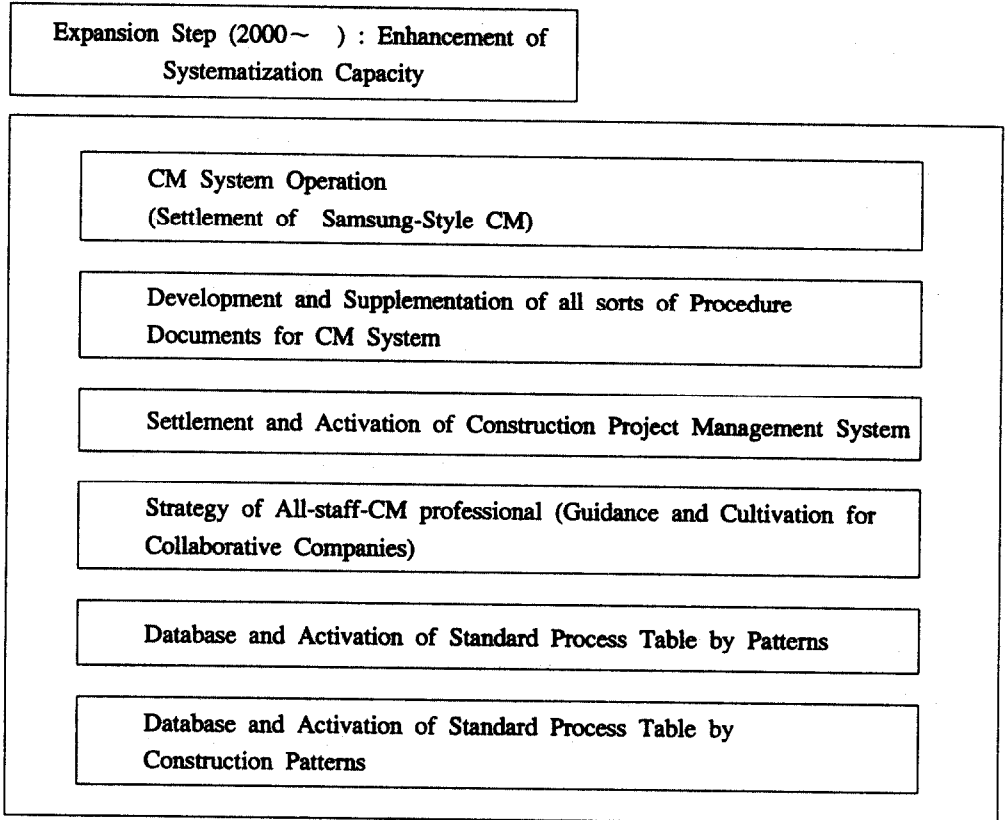


Table 4. CM Propulsion Plan by Steps (Expansion Step).



3.2. CM Propulsion Direction by Fields³⁾

Propulsion direction by fields is operated by dividing into procedure standardization, system establishment, education/publicity, and process control.

3) Samsung Corporation CM research society, CM propulsion strategy, 1997.

Table 5. CM Propulsion Direction by Fields.

Fields	Propulsion Direction
Procedure Standardization	<ol style="list-style-type: none"> 1. Aquisition of advanced CM system of Turner, Flour Daniel Parson and etc. 2. Prior Implementation of Procedure Standardization of Construction and Public Works by Work Breakdown Description 3. Substantial CM System Establishment by Standard Procedure Documents 4. Procedure Documents Development for CM Project
System Establishment	<ol style="list-style-type: none"> 1. Operation procedure settlement based on CM 2. Project Analysis and Assesment (Management and Application of Technical Database) 3. Establishment and Activation of Construction Project Management System
Education/ Publicity	<ol style="list-style-type: none"> 1. CM General Education (Overall Concept Comprehension and Philosopy Expansion) 2. Activation of In-house 'CM research team' 3. Reenforcement of Process Management Technical Education Course (Enhancement of Practical Project Adjustment Capacity) 4. CM Technical Education (Outside Consigned Education and Advanced Company OJT)
Process Control	<ol style="list-style-type: none"> 1. POOL System Application of Charging Manpower 2. Settlement of Process Work Procedure and Field process Worker's Role 3. Suggestion of Model adjustable at Domestic Field as a Exhibition field Operation 4. Realization of All-engineer-process-professional by degree

3.3. Process Control

3.3.1. Introduction and Background of Suretrak

Suretrak solves difficulty in the accumulation and application of DATA, problem of the existing process control system in the field, makes the field staff convenient to

use, and eases the accumulation and application of DATA. By the introduction of Suretrak, we would like to prepare for the 21st century as it establishes DATABASE by raising the effectiveness of process control, systematizes field supervision, organizes project management, and accomplishes activation of C.M., P.M. in future.

3.3.2. Present Condition of Suretrak Training Progression

1. Practice : Training practice is subject to engineers and officials in field, 201 people in 53 fields
2. Afterward :
 - 1) Training for chief and C.E.
 - Subject : field chief and C,E (totally 90 people)
 - Training contents: basic understanding of Suretrak (4 hr/d)
 - Training schedule: From Sep. 27, 1997 to Oct. 25, 1997 (four times divided training)
 - 2) Training for manager
 - Subject : S-ranking staff of all domestic sites and head office (totally 180 people)
 - Training contents: basic theory and operation of Suretrak (16 hr/2d)
 - Training schedule: From Oct. 6, 1997 to Oct. 25, 1997 (6 times divided training)
 - 3) Advanced course
 - Subject : managing chief(direct), sub-chief(job field manager) and main users (totally 90 people)
 - Training contents : enhancement of Suretrak operation capability designation of Scheduler staff
 - Training schedule : From Nov. 03, 1997 to Nov. 15, 1997 (four times divided training)
 - 4) Education of collaborative company: common mind expansion of process control

- Subject : designation of collaborative company of project head office as a member of Sungkeun Union(Samsung construction subcon)
- Schedule : after-report from technical team
(conference with outside ordering team)
- * Under the preparation of exhibition operation with collaborative company at 9 line field of Ki-hung Semiconductor job field (technical team)

3.4. Quality Control

3.4.1. Aquisition and Maintenance of Quality-related Certificate

ISO 9001 International Quality Management Certification

- Initial aquisition
 - o Aquisition Date : Aug. 3, 1994
 - o Certification organization : TUV BAYERN SACHSEN (Germany)
 - o Implementation of maintenance inspection
 - First inspection : Sep. 28, 1995 ~ Sep. 30
 - Second inspection : Sep. 16, 1996 ~ Sep. 19
- Renewal inspection (propulsion of unified inspection of quality and environment)
 - o Inspection : Jul. 7, 1997(Mon.) ~ 12(Sat.)
 - o Certification organization : LRQA-KOREA

Construction Quality Certification of nuclear power plant

- Certification organization : NA(Nuclear Assembly), NPT(Nuclear P. F.)
Certification
 - : ASME(American Society of Mechanical Engineer)
NR(Nuclear Repair) Certification
 - : NBBI(National Board of Boiler and pressure vessel Inspectors)
- Aquisition date : NA, NPT certification - Feb. 1991

NR certification – Feb. 1992

– Implementation of renewal inspection

- First renewal : Dec. 1993
- Second renewal : Dec. 1996

KEPIC(Korea Electric Power Industry Code) under the preparation of certification acquisition

- Prospection of certification acquisition : second half of the year, 1997

3.4.2. All-company-initiative Settlement Propulsion Progression of ISO Quality Management System

5 Exhibition Fields Operation (as of 95)

As an initial step to settle ISO 9001 certification (quality warranty system) acquired in 1994, we designate preferably five exhibition fields, and direct, educate and manage them intensively.

On the basis of which, we expand it to all companies from two years later.

○ QP(Quality Plan)

ITP(Inspection & Test Plan) sample framing/distribution and support of framing

○ Quality SYSTEM SET-UP Support

100 Exhibition Fields Operation (as of 96)

We designate 100 Exhibition Fields and propel ISO settlement on the basis of know-how of 5 Exhibition Fields Operation (as of 95)

○ Door Plate attachment of ISO 9001 exhibition field

○ Support and review of quality document framing

○ Additional designation of intensive training subject, and Implementation of training

- Implementation of intensive guidance and support for newly opened fields

(24 sites) and 7 fields approved poor in field quality inspection

- Propulsion all-out charging organization operation of ISO Quality Management of the head office (as of 96)
ISO propulsion office establishment for the propulsion of head office along with exhibition fields quality management propulsion
 - Head office quality management expansion
 - Task standard establishment and making document
(In-house rule and department task procedure document)
 - The propulsion of work enhancement, standardization, all-company-initiative know-how and etc.

- Quality management system settlement propulsion of the head office and all fields (as of 1997)
 - Introduction of autonomous quality assessment system
 - Establishment of quality organizations in each head office and intensive field management
 - Door plate detachment of ISO 9001 exhibition fields and reattachment of door plates differently on the basis of accomplished extent of quality management
 - Attachment of “ISO accomplishment door plate” on all fields, and presentation of “ISO 9001 model door plate” to superior field and incentive

3.4.3. Quality System Operation

- Re-establishment of work standard(as of 96)
 - The enforcement of task analysis by each department and the rearrangement of all-company-initiative task divided work
 - Framing of tack technical manual by each department
 - Check-up and adjustment of redundant and omitted task and INTERFACE Items by each department

- Rearrangement of in-house rule and framing of work procedure documents (totally 401 items)
 - Rearrangement of in-house rule : 99
 - Establishment and revision of work procedure documents : 302
 - Revised in-house rule and work procedure are enrolled in SINGLE (In-house communication network). All members of staff approach them.

- Quality Assessment System Operation
 - Contents
 - Preparation of the standard to assess the current field quality management operation situation objectively and assessment implementation
 - Operation progression
 - Developed RATING SYSTEM for the first time in Korea and applied it from the first half of 1996
 - * RATING SYSTEM : Assessment system to score the quality assessment results and express it objectively and numerically
 - Autonomous field quality assessment implementation in quality team as of 1996
 - Under the implementation of autonomous assessment system from 1997
 - Autonomous quality assessment methods(applied from 1997)
 - First assessment : autonomous monthly assessment by field chief
 - Second assessment : confirmation assessment of related project office twice a year. The quality organization of head office visits fields and assess (at the time of quality inspection)
 - Third assessment : The quality team implements it (at the time of quality inspection)
 - Head office construction team — twice per year
 - Extra head office department — once per year
 - Fields — once per year

3.4.4. Prospect and Problem in Future

In the aspect of construction environment, rapid changes from simple construction with salary competition to advanced technique and know-how demanding high-rise, intelligence building are occurring. Furthermore, due to opening of construction industry license based on UR protocol and appearance of numerous rival companies, it becomes infinitely competitive more than ever. Therefore, construction industry should make clients satisfied with quality not by advertisement of quality control for publicity, but in terms of corporate strategy for survival.

Comprehensive management is formally operated by from manager to front-line workers; this is the biggest problem of our quality control rather than lack of theory or system compared to advanced countries.

Externally, our theory or organization in quality control currently applied to Japanese or American company is pretty complete and in levels of head office, check-list by progression of work and construction manual for quality control as well. Although material control and construction administration in the field are formally performed, supervising system for quality control is also prepared. Externally like these, many things essential to quality control are well-equipped. However, the quality of building does not seem to improve even though they insist upon free from quantitative and poor construction in every major accident.

By concentrating on development and improvement from simple protection, future quality control will develop toward comprehensive management through modern quality concept with better skill, TQM (Total Quality Management) of humanity-centered work, and IMQ (Integrated Management of Quality), considering the creativity of human beings and aesthetic value.⁴⁾

The successful settlement of quality control in domestic construction industry is possible only if by the thought of which quality is controlled by duties of manager through front-line technician. It is then necessary to train to objectively observe all

4) construction control and management, Korea construction industry research Jan. 1997.

approaching problems and to consider with scientific analysis technique. When quality control is personally ensured that it is not simple theory, but is changeable capability through these training, QC (Quality Control) will be naturally settled via SQC (Statistical Quality Control) to TQC (Total Quality Control) to TQM (Total Quality Management).

4. Conclusion

This report analyzes the influence of construction management from rapid environmental change in our construction industry, and as corresponding plan, it presents CM settlement model of private company through early introduction and settlement of advanced construction management technique, CM.

The original purpose of introducing CM lies in strong competitiveness in construction industry through practical construction management, not in creation of new business field. In consequence of studying in environmental change of construction industry and establishment of construction management system, a conclusion lists as follows :

First, sudden environmental change in construction industry will lead to the decline in market competitiveness, deepening of competition in receiving orders, variation in subcontract system, and increase of dispute and claim.

Second, to achieve the early settlement of CM technique in our construction industry, a good attitude toward CM, the systematic development of software, establishment of CM business system, and continuous CMR training are necessary.

Third, cost management should be attained through planning, designing, and VE (Value Engineering) in the initial stage of construction by PCM (Professional Constructional Manager). Even if constructional cost in the initial stage somewhat increases, the control is necessary for the retrenchment of LCC (Life Cycle Cost).

Fourth, for high-quality construction and cost retrenchment, TQM (Total Quality

Management) should be introduced to construction industry.

Fifth, to improve capability in overall construction management, PMIS (Project Management Information System) should be established, and information in all steps from project planning to maintenance and control should be customized to Database.

Therefore, to strengthen competitiveness through quality management established based on this foundation, Samsung Construction prepares for infinite competition in the 21st century by the continuous reinforcement of CIC all-company-initiative promotion.